Abrasive Wheels and Machines

WAC 296-806-405

Summary

- In addition to the requirements in this section, you need to refer to the following sections of this chapter in order to fully protect your employees from machine hazards:
  - Requirements for All Machines, WAC 296-806-200 and WAC 296-806-300
- You need to refer to Portable Power Tools, Chapter 296-807 WAC, for requirements relating to hand-held abrasive wheel tools.

This section applies to machines that aren't hand-held and that use an abrasive wheel.

Definition:

An *abrasive wheel* is a grinding tool consisting of bonded abrasive grains. This includes diamond and reinforced wheels.

Helpful tool:

Abrasive Wheels Illustrations

You can find illustrations of various types of abrasive wheels in the Resources section of this chapter.

Abrasive Wheels and Machines

WAC 296-806-405

Summary

YOUR RESPONSIBILTY:

To make sure abrasive wheel machines and wheels are safe to use

You must

General Requirements for Abrasive Wheels

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Make sure safety guards meet specific requirements
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Summary

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Notes

WAC 296-806-40502

Make sure abrasive wheels and machines are properly designed and constructed

You must

- Make sure abrasive wheels and machines, including safety guards and flanges, manufactured on or after January 1, 2005, meet the design and construction requirements of American National Standards Institute (ANSI) B7.1-2000, Safety Requirements for the Use, Care and Protection of Abrasive Wheels.
- Make sure abrasive wheels and machines, including safety guards and flanges, manufactured before January 1, 2005 meet the design and construction requirements of American National Standards Institute (ANSI) B7.1-1970, Safety Code for the Use, Care and Protection of Abrasive Wheels.

Note:

➢ There may be a statement on the machine or in the instruction manual that the machine meets the appropriate ANSI standard. If in doubt, check with the manufacturer.

Abrasive Wheels and Machines

WAC 296-806-405

Rule

WAC 296-806-40504

Make sure machines have safety guards

You must

- Use abrasive wheels only on machines that have safety guards.
- Make sure the safety guard:
  - Is mounted so it maintains proper alignment with the wheel
  - Is mounted with fasteners strong enough to keep the guard in position if a wheel breaks
  - Covers the spindle end, nut, and flange projections.

Exemption:

- Safety guards aren't required on machines that use:
  - Wheels for internal grinding while advancing, retracting or within the work
  - Types 16, 17, 18, 18R, and 19 cones and plugs and threaded hole pot balls where either:
    - The work offers protection
      or
    - The size doesn't exceed 3 inches in diameter by 5 inches long
  - Notched, segmented, or continuous rim metal centered diamond lapidary wheels that are:
    - Used with a coolant deflector
      and
    - Operated at 3,500 SFPM or less
  - Type 1 reinforced wheels that are:
    - 3 inches or less in diameter
    - 1/4 inch or less thick
    - Operating at peripheral speeds of 9,500 SFPM or less
    - Used by operators wearing safety glasses and face shields
    - Valve seating grinding wheels
    - Remotely operated machines in an enclosure that will retain the pieces of a broken wheel

WAC 296-806-40506

Make sure safety guards meet specific requirements

You must

- Make sure the machine safety guards meet the requirements of Table 405-1, Guard Requirements.

Definition:

Maximum exposure angle is the largest part of a wheel that does not need to be covered by a safety guard.

Note:

- The maximum exposure angle is measured by lines starting at the center of the spindle and extending to the ends of the guard at the wheel periphery.
- Visors and other accessory equipment are used in determining the size of the guard opening only if they're at least as strong as the safety guard.

-Continue-

WAC 296-806-40506 (Continued)

Table 405-1
Guard Requirements

Machine	Maximum exposure angle and other guard restrictions
Bench, pedestal, or floorstand grinders	• Not higher than 65 degrees above the horizontal centerline of the wheel • ¼ (90 degrees) of the wheel for grinding done at or above the horizontal centerline of the wheel • 125 degrees if the work has to contact the wheel below the horizontal centerline of the wheel
Cylindrical grinders	• ½ (180 degrees) of the wheel • Not higher than 65 degrees above the horizontal centerline of the wheel
Surface grinders	• 150 degrees of the wheel • Not higher than 15 degrees below the horizontal
Cutting-off machines	• ½ (180 degrees) of the wheel
Swing frame grinders	• ½ (180 degrees) of the wheel • Encloses the top ½ of the wheel
Swing frame grinders using cup wheels	• ½ (180 degrees) of the wheel • Covers the wheel on the side towards the operator
Semiautomatic snagging machines	• ½ (180 degrees) of the wheel • Covers the wheel on the side towards the operator
Machines used for top grinding	• As small as possible up to 1/6 (60 degrees) of the wheel

WAC 296-806-40508

Provide a tongue guard on bench, pedestal, floorstand, and cylindrical grinders

You must

- Make sure, if the operator stands in front of the opening in the safety guard, that the safety guard (tongue guard) at the top of the opening is adjusted to within ¼ inch of the wheel.

Definition:

The *tongue guard* is an integral part of a safety guard that's located where the upper exposed part of the abrasive wheel meets the safety guard. It can be adjusted as necessary to maintain a set distance from the constantly decreasing diameter of the wheel.

Abrasive Wheels and Machines

WAC 296-806-405

Rule

WAC 296-806-40510

Use a work rest for off-hand grinding

Exemption:

- You don't need to use a work rest if:
  - The size, shape, weight or finishing area of the workpiece prevents its use

    or
  - Contact with the grinding wheel below the horizontal plane of the spindle is necessary

You must

- Use a work rest to support the work.
- Make sure the work rest is:
  - Rigidly constructed
  - Adjustable to compensate for wheel wear
  - Adjusted only when the wheel is stopped
  - Securely clamped after each adjustment
  - Kept within 1/8 inch of the wheel

WAC 296-806-40512

Make sure abrasive wheels are safe to use

You must

- Do the following before mounting a wheel:
  - Visually inspect the wheel for cracks or damage
  - Perform a ring test for cracks if the size and shape of the wheel permits testing
  - Make sure the spindle speed of the machine isn't greater than the operating speed of the wheel
- Make sure a damaged or cracked wheel isn't mounted or used.

Note:

➢ Wheels that have gouges, grooves, other damage, or material buildup on the grinding surface need to be dressed or trued to correct the problem. Wheels that can't be trued are considered damaged and can't be used.

Helpful tool:

You can find information about how to perform a ring test in the Resources section of this chapter.

Abrasive Wheels and Machines

WAC 296-806-405

Rule

WAC 296-806-40514

Mount wheels properly

You must

1) Make sure wheels fit freely on the spindle, wheel sleeves, or adaptors, and remain free under all grinding conditions.
2) Make sure wheel, blotter and flange surfaces that contact each other are flat and free of foreign particles.
3) Make sure any reducing bushing used in the wheel hole:
   - Fits freely on the spindle and maintains proper clearance
     and
   - Doesn't exceed the width of the wheel or contact the flanges
4) Make sure that multiple wheels mounted between a single set of flanges are either:
   - Cemented together
     or
   - Separated by spacers that have a diameter and bearing surface that's the same as the mounting flanges

Abrasive Wheels and Machines

WAC 296-806-405

Rule

WAC 296-806-40516

Use proper flanges

You must

- Mount all abrasive wheels between flanges that have a diameter at least 1/3 the diameter of the wheel.

Exemption:

- This flange requirement doesn't apply to the following wheels:
  - Mounted wheels (wheels permanently bonded to a shaft or mandrel)
  - Abrasive disc wheels (inserted nut, inserted washer and projecting stud type)
  - Plate mounted wheels
  - Cylinder, cup, or segmental wheels mounted in chucks
  - Types 27, 28, and 29 wheels
  - Internal wheels less than 2 inches in diameter
  - Modified Type 6 and 11 wheels (Terrazzo)
  - Types 1 and 27A cutting-off wheels

You must

- Make sure flanges are:
  - Dimensionally accurate
  - Properly balanced
  - Flat
  - Free of rough surfaces or sharp edges
- Make sure the driving flange is:
  - Part of the spindle
    or
  - Securely fastened to the spindle

-Continued-

Rule

WAC 296-806-40516 (Continued)

- Make sure, if a wheel is mounted between two flanges, that both flanges:
  - Are the same diameter
    and
  - Have equal bearing surfaces

Exemption:

- The following wheels don't require same diameter, equal bearing surface flanges:
  - Types 27, 28, and 29 wheels with adaptors
  - Modified Types 6 and 11 wheels with tapered K dimension
  - Internal wheels less than 2 inches in diameter

WAC 296-806-40518

Make sure flanges are in good condition

You must

- Make sure flange bearing surfaces are in good condition.
- Replace or remachine a flange with a mounting surface that has any of the following problems:
  - Warped
  - Burred on the bearing surface
  - Excessively worn (thickness or diameter)
  - Out of true

Reference:

Flanges that are refaced or trued need to satisfy minimum dimension requirements specified in Safety Requirements for the Use, Care and Protection of Abrasive Wheels, ANSI B7.1-2000.

WAC 296-806-40520

Use specific flanges for Type 1 cutting-off wheels

You must

- Mount Type 1 cutting-off wheels between flanges that are:
  - Properly relieved with matching bearing surfaces
  - At least ¼ the wheel diameter

WAC 296-806-40522

Use specific flanges for Type 27A cutting-off wheels

You must

- Mount Type 27A cutting-off wheels between flanges that are:
  - Flat (unrelieved) with matching bearing surfaces
    and
  - At least ¼ the wheel diameter

Abrasive Wheels and Machines

WAC 296-806-405

Rule

WAC 296-806-40524

Use blotters when required

Exemption:

- You don't need to use a blotter with any of the following:
  - Mounted wheels (wheels permanently bonded to a shaft or mandrel)
  - Abrasive disc and Type 2 wheels which are mounted by inserted nuts, inserted washers, or projecting studs
  - Plate mounted wheels
  - Wheels mounted in chucks (such as cylinders and segmental wheels)
  - Types 27, 28, and 29 wheels
  - Type 1 and Type 27A cutting-off wheels
  - Internal wheels less than 2 inches in diameter
  - Diamond and cubic boron nitride wheels with metal or carbon fiber cores

You must

- Use a blotter between each flange and the abrasive wheel surface to uniformly distribute flange pressure.
- Make sure the blotter covers the entire flange contact area.
- Use a new blotter each time a wheel is mounted unless the wheel has a blotter already attached to it by the manufacturer.
- Make sure scuffed or damaged blotters aren't used.

WAC 296-806-40526

Meet specific blotter requirements when using modified Types 6 and 11 wheels (terrazzo)

You must

- Apply the blotter to the flat side only when mounting Modified Types 6 and 11 wheels (terrazzo).